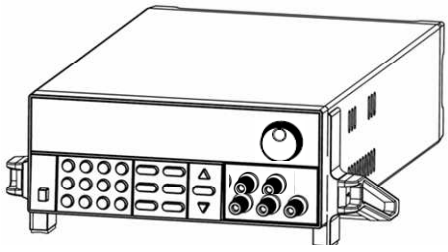
USER'S GUIDE

High Resolution and High Speed
Programmable Power Supply
Models IT6100 Series



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Ver1.1 /July, 2005/ IT6100-527

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About your safety

Pease review the following safety precautions before operating our equipment.

General information

The following safety precautions should be observed before using this product and any associated instrumentations. Although some instruments and accessories would be used with non-hazardous voltages, there are situations where hazardous conditions may be present.

This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid possible injury. Read and follow all installation, operation, and maintenance information carefully before using the product. Refer to this manual for complete product specifications.
If the product is used in a manner not specified, the protection provided by the product may be impaired.
Before performing any maintenance, disconnect the line cord and all test cables.

Protection from electric shock

Operators of this instrument must be protected from electric shock at all times. The responsible body must ensure that operators are prevented access and/or insulated from every connection point. In some cases, connections must be exposed to potential human contact. Product operators in these circumstances must be trained to protect themselves from the risk of electric shock. If the circuit is capable of operating at or above 1000 volts, no conductive part of the circuit may be exposed.

Definition of users

Responsible body is the individual or group responsible for the use and maintenance of equipment is operated within its specifications and operating limits, and for ensuring that operators are adequately trained.
Operators use the product for its intended function. They must be trained in electrical safety procedures and proper use of the instrument. They must be protected from electric shock and contact with hazardous live circuits.
Service is only to be performed by qualified service personnel.
Safety symbols and terms

Connect it to safety earth ground using the wire recommended in the user manual.

The symbol on an instrument indicates that the user should refer to the operating instructions located in the manual.

High voltage danger

Certification and Warranty

Certification

We certify that this product met its published specifications at time of shipment from the factory.

Warranty

This instrument product is warranted against defects in material and workmanship for a period of one year from date of delivery. During the warranty period we will, at its option, either repair or replace products which prove to be defective. For warranty service, with the exception of warranty options, this product must be returned to a service facility designated by us. Customer shall prepay shipping charges by (and shall pay all duty and taxes) for products returned to the supplier for warranty service. Except for products returned to customer from another country, supplier shall pay for return of products to customer.

Limitation of Warranty

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by the Customer, Customer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation and maintenance.

Introduction

IT6100 Series power supplies are high resolution and high speed programmable DC power supplies. This series have very small size of 2U, and they are equipped with $5\frac{1}{2}$ digital voltage meter and mΩ meter. That means you don't need to invest extra money to purchase digital meter. This series offer flexible solution to general laboratory and workshop requirement.

Convenient bench-top features:

- VFD display
- Liner programmable power supply with low ripple and noise
- Very high accuracy and resolution of 0.1mV/0.1mA
- High rise speed<30mS
- Equipped with $5\frac{1}{2}$ digital voltage meter and mΩ meter
- Small size can be installed in standard 19'' rack or bench top
- Remote control via USB/RS232/GPIB
- Limit voltage protection
- Over current/temperature protection
- Free software for control the machine on computer

Chapter1 Quick Reference

1.1 The Front Panel

IT6120 Series' Front Panel

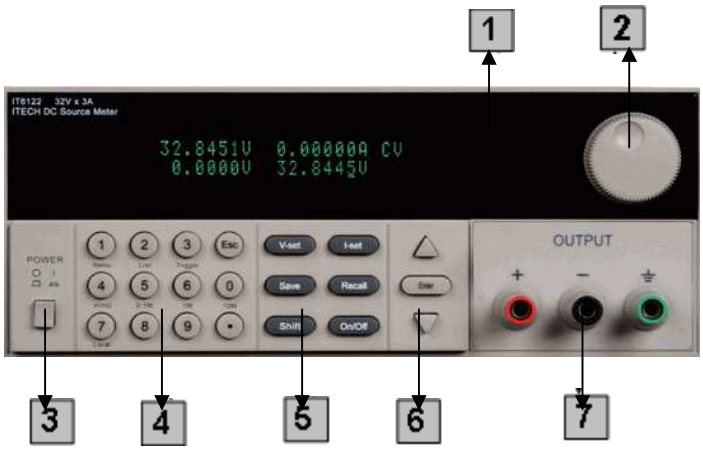


Fig 1.1 IT6120 series' front panel

1. VFD display
2. Rotary knob
3. Power switch
4. Numeric keys and ESC key
5. Function keys
6. Up , down key and ENTER key
7. Output terminals

IT6150 Series' Front Panel

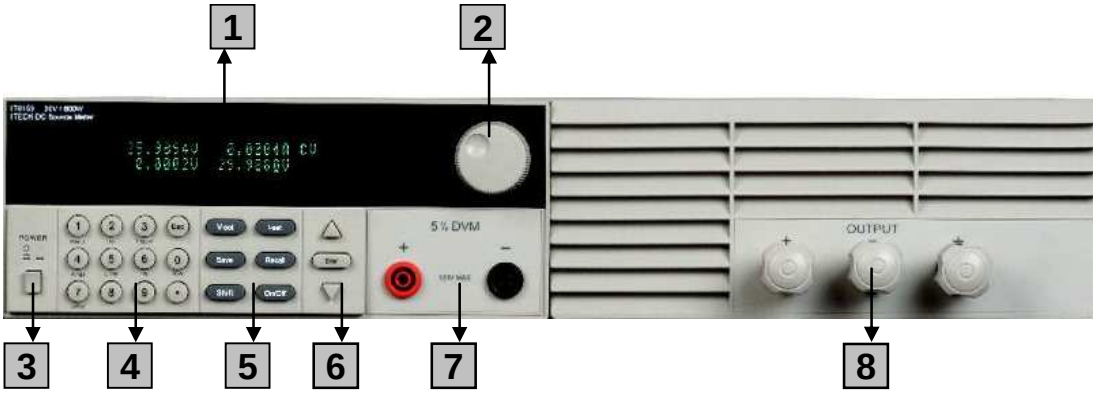


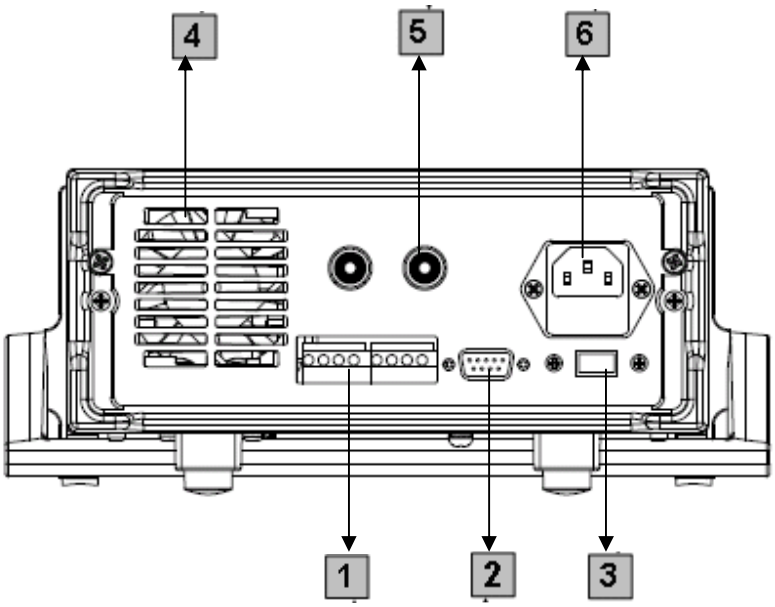
Fig 1.2 IT6150 series's front panel

1. VFD display
2. rotary knob
3. power switch
4. Numeric keys and ESC key

5 function keys
6 up, down key and ENTER key
7 input terminals
8 output terminals

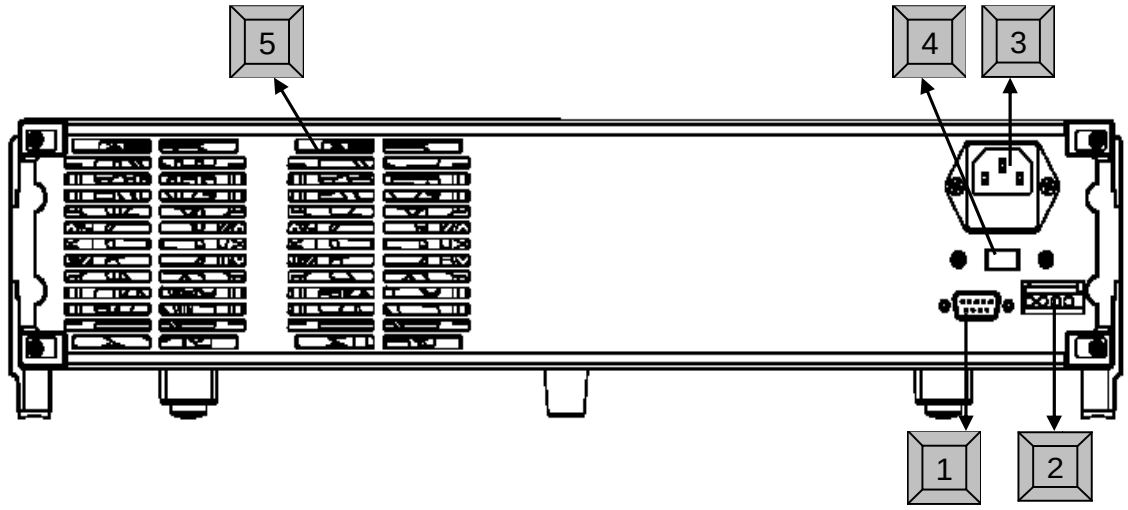
1.2 The Rear Panel

① **IT6120 Series' Rear Pane**



1 8-Pin Trigger and Remote sensing connectors
2 9-Pin COM port interface connector
3 Power switch (110V / 220V)
4 Cooling window
5 voltage measurement terminals
6 Power socket

② **IT6150 Series' Rear Panel**



1. 9-Pin COM port interface connector
2. 4-Pin Trigger and Remote sensing connectors
3. Power socket
4. Power switch (110V / 220V)
5. Cooling window

1.3 Preliminary Checkout

The following steps help you verify that the power supply ready for use.

1. Check the list of supplied items

Verify that you have received the following items with your power supply. If anything is missing, contact your nearest Sales Office.

□ One power cord for your location
□ One user's manual
□ Calibration Report
□ CD-Rom
□ Communication cable (optional)

2. Connect the power cord and turn on the power supply

When you turn on the power supply, the front-panel display will light up briefly while the power supply performs its power-on self-test. All the VFD annunciators will light up at once. To review the display with all annunciators, you can check if there is any stroke loss on any annunciator.

3. Checkout Procedure

If the EEPROM was damaged or the latest operation data in EEPROM is lost, the VFD will display as follows:

ERR EEPROM

If the calibration data in EEPROM is lost, the VFD will display as follows:

ERROR Calibration Data

If the latest state of the power supply in EEPROM is lost, the VFD will display as follows:

Error Config Data

If you press the “shift” button when power on the power supply, the VFD displays the information of the machine, version of the firmware and the series number of the machine.

Sourc: XXV XA Meas: XXV **Ver: 1.72 SN:5975002002**

Press “Esc” to exit, VFD displays as follows:
The first row is the actual output voltage value and current value, and the state of power supply; the second row is voltage value measured by voltage meter, and output voltage value set by power supply.

0.000V 0.00000A OFF **0.000V 3.000V**

The first line is the actual voltage value and current value, the state of the power supply.
The second line is the voltage value tested by voltage meter and the setting voltage of the power supply.

Warning: The power supply is shipped from the factory with a power-line cord that has a plug appropriate for your location. Your power supply is equipped with a 3-wire grounding type power cord; the third conductor being the ground. The power supply is grounded only when the power-line cord is plugged into an appropriate receptacle. Do not operate your power supply without adequate cabinet ground connection.

1.4 Output Checkout

The following procedures check to ensure that the power supply develops its rated outputs and properly responds to operation from the front panel.

Voltage Output Checkout
The following steps verify basic voltage functions without load.

1) Turn on the power supply.

2) Enable the outputs
Press Out on/off key to let the CV annunciator turn on to light.

3）Set the voltage value
Set some different voltage values, then wait till the Meter mode to check if the VFD displayed voltage value is the same as the set voltage value, and to check if the VFD displayed current value is nearly zero.

4） Ensure that the voltage can be adjusted from zero to the full rated value.

Current Output Checkout
The following steps check basic current functions with a short across the power supply's output.

1） Turn on the power supply.

2）Disable the output
Press On/Off key to ensure that the output is disabled.

3) Connect a short across (+) and (-) output terminals with an insulated test lead.
Use a wire size sufficient to handle the maximum current.

4) Enable the output.

5) Adjust the voltage value to 1.0 volt.
Adjust the voltage to 1.0 volt to ensure the power supply is in CC operation mode. The CC annunciator will turn on.

6) Adjust the current value.
Set some different voltage values, then wait till the Meter mode to check if the VFD displayed current value is the same as the set voltage value, and to check if the VFD displayed voltage value is nearly zero.

7) Ensure that the current can be adjusted from zero to the full rated value.

8) Turn off the power supply and remove the short wire from the output terminals.

1.5 If the power Supply Does Not Turn On

Use the following steps to help solve problems you might encounter when turning on the instrument. If you need more help, refer to chapter 6 for instructions on returning the instrument to the supplier for service.

1. Verify that there is AC power to the power supply.
First, verify that the power cord is firmly plugged into the power receptacle on the rear panel of the power supply. You should also make sure that the power source you plugged the power supply into is energized. Then, verify that the power supply is turned on.

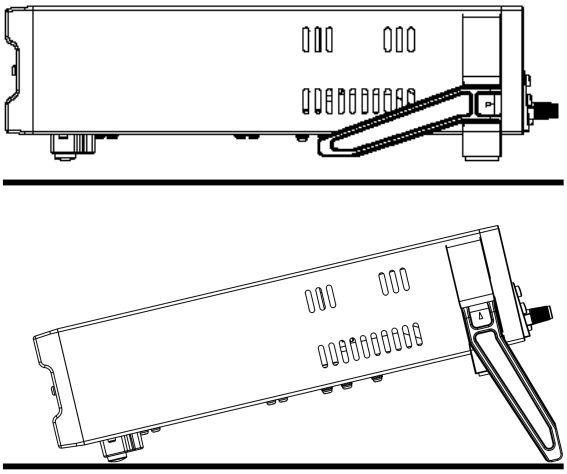
2. Verify the power-line voltage setting.
The line voltage is set to the proper value for your country (110VAC or 220VAC) when the power supply is shipped from the factory. Change the voltage setting if it's not correct.

3. Verify that the correct power-line fuse is installed.
If the fuse was damaged, please see the table below to replace the fuse for your power supply.

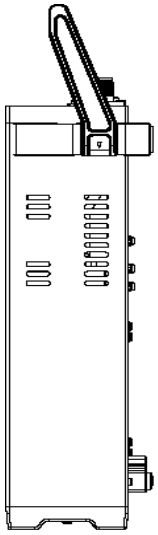
Model	Fuse Description(110VAC）	Fuse Description（220VAC）
IT6121	T2.5A 250V	T1.25A 250V
IT6122	T2.5A 250V	T1.25A 250V
IT6123	T2.5A 250V	T1.25A 250V
IT6151	T10A 250V	T5A 250V
IT6152	T10A 250V	T5A 250V
IT6153	T10A 250V	T5A 250V
IT6154	T10A 250V	T5A 250V

1.6 To Adjust the Carrying Handle

To adjust the position, grasp the handle by the sides and pull outward. Then, rotate the handle to the desired position.



Bench-top viewing positions

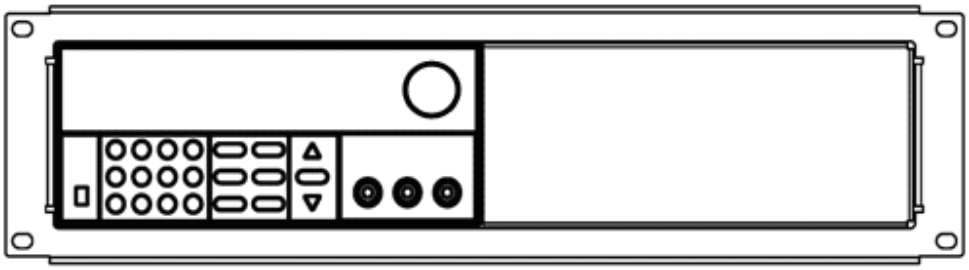


Carrying position

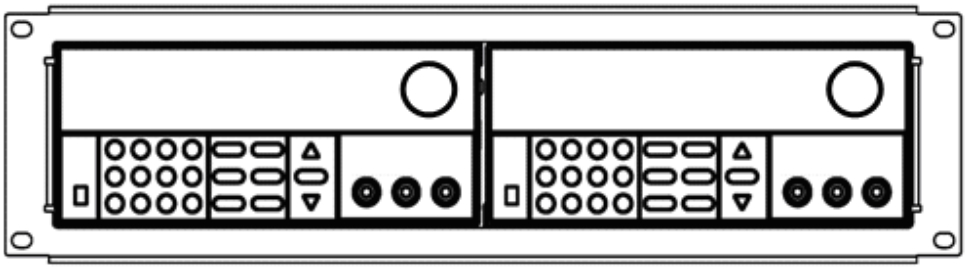
1.7 To Rack Mount the Instrument

You can mount the power supply in a standard 19-inch rack cabinet using the IT-E151 rack mount kit.

Note: Remove the carrying handle and the two plastic ears before rack-mounting the instrument. To remove the handle, grasp the handle by sides and pull outwards and rotate it to a special position to let the arrow on the handle and the arrow on the plastic ears be in opposite directions, then pull the handle outward. After removing the handle, you can use a screwdriver to remove the two plastic ears.



To rack mount a single instrument, order rack mount kit IT-E151



To rack mount two instruments side-by-side, order rack mount kit IT-E151, you needn't to use the front cover panel.

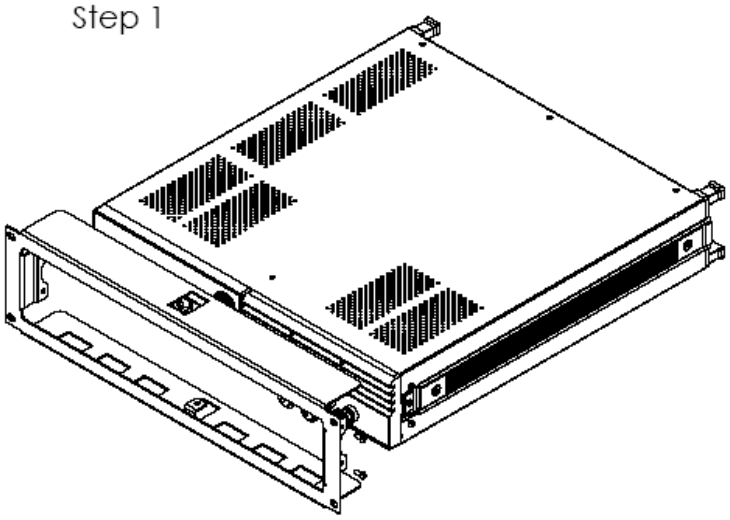
IT6150 series power supply rack mount:

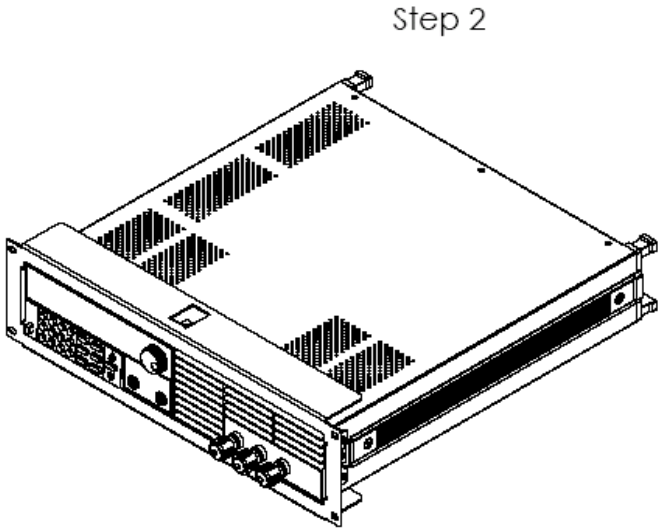
IT6150 series' power supply installation:

IT6150 series power supply can be mounted in standard 19 inch rack, IT-E151 is the accessory we prepared for customer.

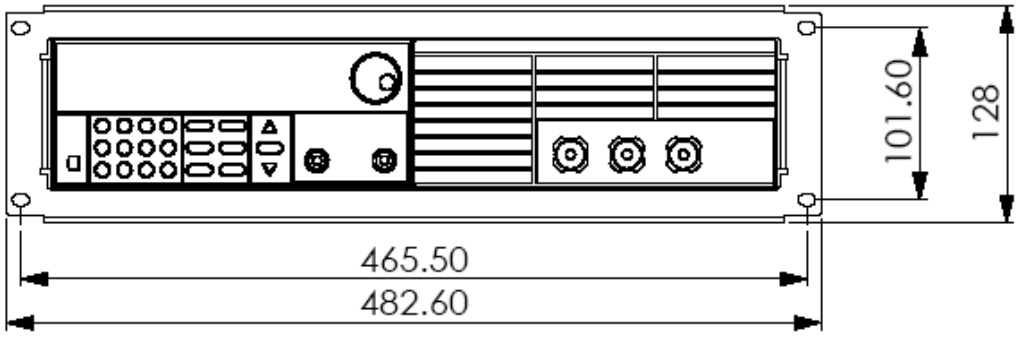
Remove the right and left plastic ears on the power supply , and then put it in the IT-E151,and then tighten the screws.

Steps:





the front picture when install IT6150 power supply in IT-E151



Unit: milimeter（mm）

1.8 Optional accessory

IT-E151: 19 inch rack mount
IT-E131: RS232 communication cable
IT-E132: USB communication cable
IT-E135: GPIB connector

Chapter 2 Specifications

2.1 Specifications

IT6120 Series DC Power Supply

Parameter		IT6121	IT6122	IT6123
Output Ratings (0 ℃~40 ℃)	Voltage	0 ~20V	0 ~32V	0~72V
	Current	0~5A	0~3A	0~1.2A
	LVP	0 ~21V	0 ~33V	0 ~73V
Load Regulation ±(％of output+offset)	Voltage	≤0.01%+2mV		≤0.01%+2mV
	Current	≤0.05%+1mA		≤0.05%+0.3mA
Line Regulation ±(％of output+offset)	Voltage	≤0.01%+1mV		≤0.01%+2mV
	Current	≤0.05%+0.1mA		≤0.05%+0.05mA
Programming resolution	Voltage	0.5mV		2mV
	Current	0.1mA		0.02mA
Readback resolution	Voltage	0.1mV		0.5mV
	Current	0.05mA	0.01mA	0.01mA
Programming accuracy, 12months, (25 ℃ ± 5 ℃) ±(％of output+offset)	Voltage	≤0.03%+3mV		≤0.03%+6mV
	Current	≤0.05%+2mA		≤0.05%+1mA
Readback accuracy 12months, (25 ℃ ± 5 ℃) ±(％of output+offset)	Voltage	≤0.02%+3mV		≤0.02%+5mV
	Current	≤0.05%+2mA		≤0.05%+1mA
Ripple (20Hz ~20MHz)	Voltage	≤3mVp-p	≤4mVp-p	≤5mVp-p
	Current	≤3mArms	≤3mArms	≤3mArms
Temperature coefficient, (0 ℃~40 ℃) ±(％of output+offset)	Voltage	≤0.02%+3mV		≤0.02%+5mV
	Current	≤0.05%+2mA		≤0.05%+0.5mA
Readback temperature, coefficient, ±(％of output+offset)	Voltage	≤0.02%+3mV		≤0.02%+5mV
	Current	≤0.05%+2mA		≤0.05%+0.5mA
Dimension(mm)		214.5mmW×88.2mmH×354.6mmD		
Weight		8 kg		

IT6150 Series High Resolution Power Supply

Parameter		IT6151	IT6152	IT6153	IT6154
Output Ratings (0 ℃~40 ℃)	Voltage	0~5.2V	0~20V	0~30V	0~60V
	Current	0~60A	0~27A	0~18A	0~9A
	LVP	0~5.5V	0~21V	0~31V	0~61V
The model of remotsense±(%of output+offset)	Voltage	<0.05%+30mV	<0.05%+20mV	<0.05%+15mV	<0.05%+10mV
	Current	<0.1%+10mA	<0.1%+5mA		<0.1%+2mA
Line Regulation ±(%of output+offset)	Voltage	<0.02%+1mV	<0.02%+1mV		<0.02%+2mV
	Curren	<0.1%+1mA	<0.01%+1mA		<0.01%+0.1mA
Programming resolution	Voltage	0.1mV	0.5mV		0.5mV
	Current	1mA	1mA		1mA
Resdback resolution	Voltage	0.1mV	0.1mV		0.5mV
	Current	1mA	0.1mA		0.1mA
Programming accuracy,12 months±(%of output +offset)	Voltage	0.02%+2mV	<0.02%+6mV		≤0.02%+12mV
	Current	<0.1%+30mA	<0.1%+15mA		<0.05%+10mA
Readback accuracy ±(%of output+offset)	Voltage	0.02%+1.5mV	0.02%+3mV		0.02%+6mV
	Current	<0.05%+15mA	<0.05%+10mA		<0.05%+5mA
Ripple (20Hz~20MHz)	Voltage	≤4mVp-p	≤4mVp-p		≤5mVp-p
	Current	<15mArms	<5mArms		<3mArms
Temperature Coefficient (0 ℃~40 ℃) ±(%of output+offset)	Voltage	<0.02%+2mV	<0.02%+5mV		<0.02%+10mV
	Current	<0.1%+30mA	<0.1%+15mA		<0.05%+5mA
Readback temperature coefficient±(%of output+offset)	Voltage	<0.02%+2mV	<0.02%+5mV		<0.02%+10mV
	Current	<0.1%+30mA	≤0.05%+10mA		≤0.05%+5mA
Dimension(mm)		429mmW×88.2mmH×458.9mmD			
Weight		29 kg			

2.2 Supplemental Characteristics

State Storage Memory
Fifty (50) user-configurable stored states

Recommended Calibration Interval
Once a year

AC Input Ratings (selectable via switch on the rear panel)
Option Opt.01: 220VAC ± 10%, 47 to 63 Hz
Option Opt.02: 110 VAC ± 10%, 47 to 63 H

Maximum power

IT6121	IT6122	IT6123	IT6151	IT6152	IT6153	IT6154
100W	100W	100W	540W	540W	540W	540W

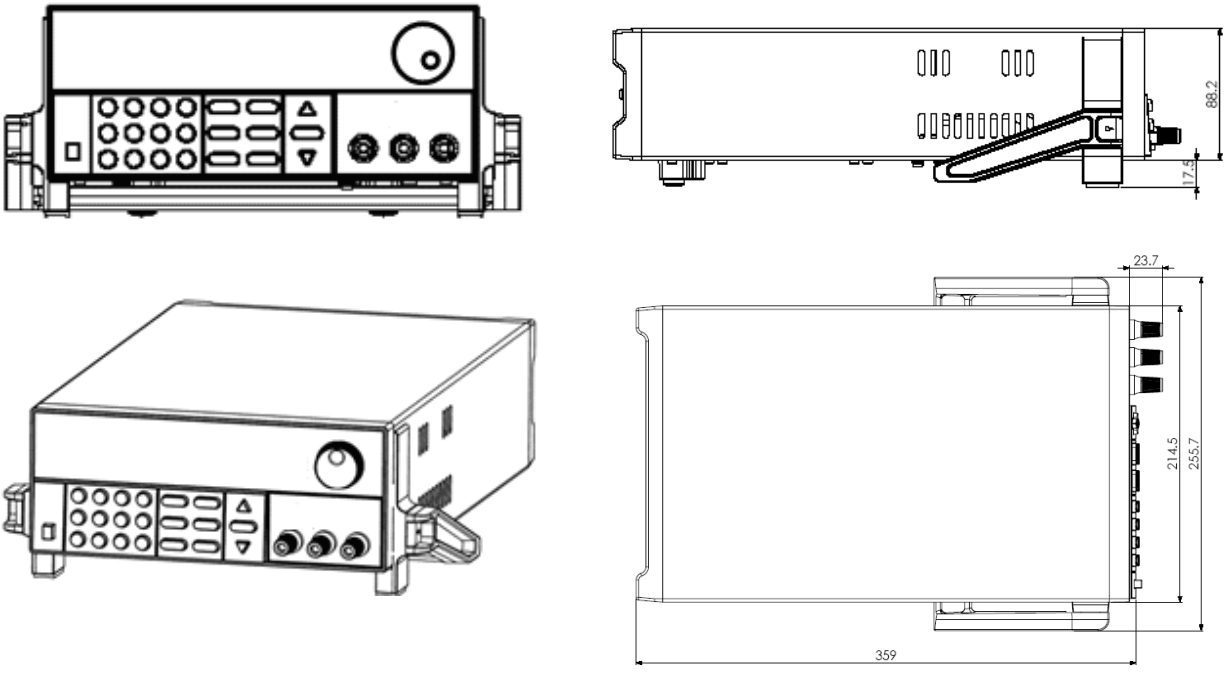
Cooling
Fan cooled

Operating Temperature
0 to 40 ℃

Storage Temperature
-20 to 70 ℃.

Environmental Conditions
Designed for indoor use in an installation category II, pollution degree 2 environment. Designed to operate at maximum relative humidity of 95% and at altitudes of up to 2000 meters.

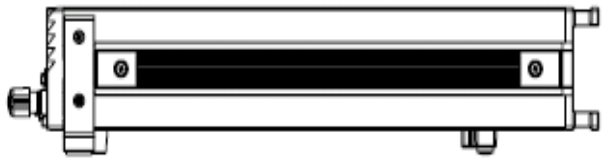
Dimensions of IT6120 Series
214.5mmW x 88.2mm H x 354.6m D

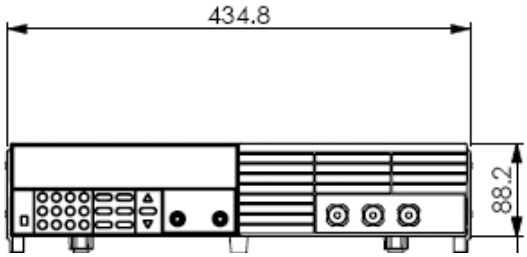


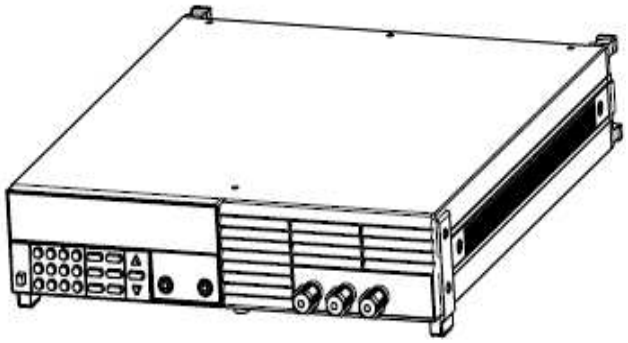
(Unit: mm)

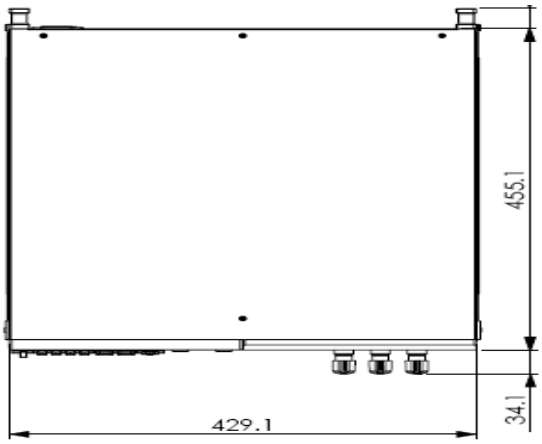
Dimensions of IT6150 Series

429mmW×88.2mmH×354.6mmD









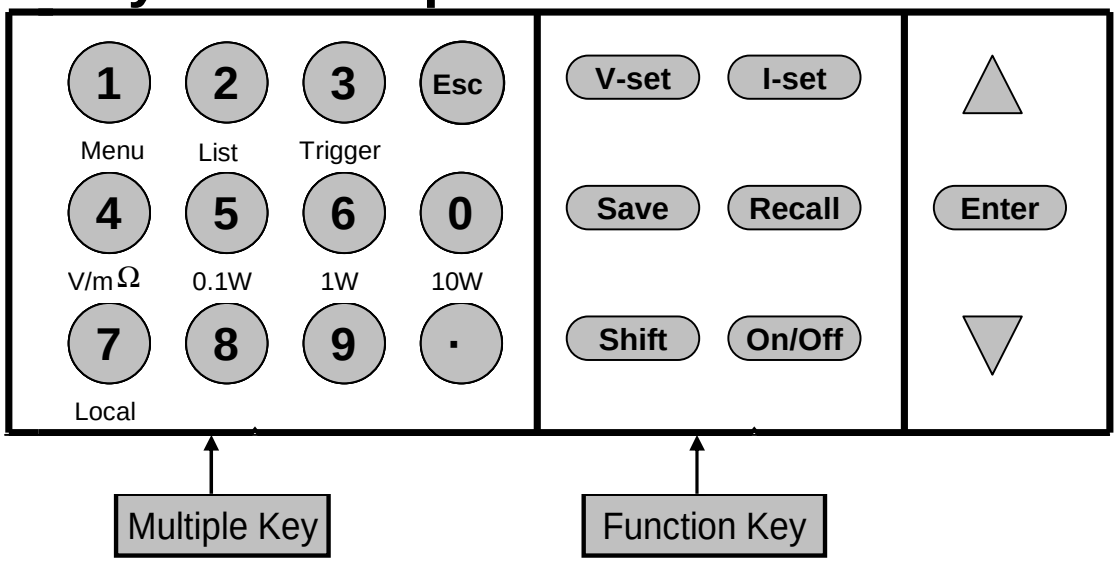
Chapter 3 Front-panel Operation

So far you have learned how to install your power supply and do quick start. During the quick start, you were briefly introduced to operating from the front panel as you learned how to check basic voltage and current functions. This chapter describes in detail the use of the front-panel keys and shows how they are used to accomplish power supply operation.

This chapter is divided into the following sections:

- Front-Panel Operation Overview,
- Setting Voltage
- Setting Current
- Storing Operation
- Menu Operation
- On/Off Operation
- Remote Sense Function
- mΩ Meter
- $5\frac{1}{2}$ Digital Voltage Meter

3.1Keyboard Disposal



Multiple Key Instruction

V/mΩ: $5\frac{1}{2}$ Digital Voltage Meter / mΩ Meter

0.1W: The range of mΩ Meter is 0.1W

1W: The range of mΩ Meter is 1W

10W: The range of mΩ Meter is 10W

Function Key Instruction

V-set	Set the voltage value
I-set	Set the current value
Save	Save the currently data of the power supply to internal register
Recall	Recall the data from the internal register
Menu	Set the parameter of power supply
On/Off	Set the output state of power supply
Shift	Use it with multiple key

▲: Up key

▼: Down key

Enter: Press it to confirm

3.2 Front-panel Operation Overview

The following section describes an overview of the front-panel keys before operating your power supply.

1. The power supply is shipped from the factory configured in the front-panel operation mode. At power-on, the power supply is automatically set to operate in the front-panel operation mode. When in this mode, the front panel keys can be used.

2. When the power supply is in remote operation mode, you cannot use the front-panel. A change between front-panel and remote operation modes will not result in any change in the output parameters. You can change the front-panel and remote operation modes by computer.

3. The output of the power supply can be enabled or disabled from the front panel by pressing On/Off key.

4. The VFD display shows the present operating status of the power supply with annunciators. Turn on the power supply, VFD displays two lines data. The first line shows the actual output voltage value, current value and the state of the power supply. The second line shows the voltage value tested by the voltage meter and the output value of the power supply.

3.3 Setting Voltage

The constant voltage range is from 0V to the maximum voltage value of each model. It is very easy for you to set the constant voltage output. You have 2 solutions to set the constant voltage value.

Solution1:

Step1: Power on the IT6100 series instrument

Step2: Press the ▲ and ▼ keys to change the value

Solution2:

Step1: Power on the IT6100 series instrument

Step2: Press V-set

Step3: Use the numeric keys 0 to 9 or ▲ and ▼ keys to change the voltage value.

Step4: Press Enter to confirm.

3.4 Setting Current

The constant current output range is from 0A to the maximum current value of each type. It is very easy for you to set the constant current output.

Step1. Power on the IT6800 series instrument
Step2. Press I-Set key
Step3. Use the numeric keys 0 to 9 or use ▲and ▼keys to change the current value
Step4. Press Enter key to confirm the value

3.5 Saving and Recalling Operation

You can use Save or Recall or use the SCPI order *SAV、*RCL to store up to 50 different output states in storage register locations(1 to 50). If the fast recall function is turned on, you can recall the saved settings by pressing numerical key （0~9）. You can store the followings: the maximum output voltage value, the voltage setting value, the current setting value and the step value of voltage.

You can use Save and 0~50 numeric key，press Enter, and store the parameter of IT6100 series into the register.

You can use Recall and 0~50 numeric key, press Enter, and recall the parameter stored before from the register.

3.6 Menu Operation

3.6.1 Menu Description

Press MENU to indicate operation mode. View the menu in VFD, and use ▲ and ▼to scroll through the complete menu list as following. If press ENTER, you could get the selected menu function. Press ESC back to the previous menu selection page.

MENU			
Config			
	Config Init.		Return to the factory default setup value.
	Out Recall		Setting Power-on state of power supply.
		On	When users turn on the power supply; its setup value will keep the state of last time as users turned off the power supply.
		Off<Default>	Disable this function.
	PWR-ON Recall		Setting power-on parameter of power supply
		On	When users turn on the power supply; its setup value will keep the state of last time as users turned off the power supply.
		Off<Default>	Disable this function.
	Key Sound Set		Keypad sound setting.
		On<Default>	Enable key sound.
		Off	Disable key sound
	Knob Lock Set		Setup Rotary knob lock state.
		On	Lock Rotary knob.
		Off< Default >	Unlock Rotary knob.
	Remote Sense		Setup voltage measurement Mode.

		On	The electronic load will measure input voltage from the remote sense connector.
		Off< Default >	The power supply will measure input value from the front panel connector.
	ShortCut Recall		Quickly recall the data stored before
		On	Enable this function
		Off<Default>	Disable this function
	OVP Set		Setting over voltage protection
		On	Enable this function
		Off< Default >	Disable this function
	Meter Rate Set		Setting the speed of power supply
		High	High speed
		Low< Default >	Low speed
	Baudrate set		Setting baud rate
		Baudrate 4800 < Default >	
		Baudrate 9600	
		Baudrate 19200	
		Baudrate 38400	
	Comm. Parity		Communication parity bit set.
		None< Default >	
		Even	
		Odd	
	Address Set		Setting communication address(range from 0to 254)
		Address= * *	
	Port Mode		Select function of port
		Trigger< Def >	
		RI/DIF	
		DIGITAL I/O	
	Trig Source		Setting trigger mode
		Immediat<Def>	Trigger signals from Shift + Trigger key
		External	Trigger signals from the TRIG connector in the rear panel.
		Bus	Communication command trigger mode.
	RI Mode		Control the output mode
		Off< Default >	Disable this function
		Latching	
		Live	
	DFI Source		Discrete Fault Indicator
		Off< Default >	
		QUES	Question Bit
		OPER	Operation Bit
		ESB	Event State Bit
		RQS	Require Bit
	Key Lock Set		Setting keypad password. Press ENTER directly to disable the key lock function.
		Password= * * * *	
	Exit		

System Set			
	Max Volt. set	Setup the Maximum Voltage.	
	Max= ＊ ＊ ＊ ＊		
	Step Volt Set	Set voltage step	
	Step= ＊ ＊ ＊ ＊		
	Exit		
List Set			
	Call ListFile	Recall list operation file.	
	Edit ListFile	Edit list operation file.	
	Continuous		
		Once	
		Repeat	
	Step		
		Once	
		Repeat	
	Save Mode Set	Users can choose 4 kinds of memory space to save the list file.	
	8 X 25 Steps		
	4 X 50 Steps		
	2 X 100 Steps		
	1 X200 Steps		
	Exit		
Out On Timer	Output timer，if you start this function, the power supply will turn off after the time you set.		
	Timer State	Setting POWER ON timer state	
	On	When users choose the timer state ON, and then turn on the power supply's output, the POWER ON TIMER will start working, and when the POWER ON TIMER is reach the setup time, the power supply's output will turn off automatically.	
	Off< Default >		
	Timer Set	Setting time of POWER ON timer.	
	Timer= ＊ ＊ **S**		
	Exit		
Exit			

3.6.2 Menu Function

Output Recall

This function can help you set the output state when the power supply is powered on. If you select **On**, the power supply will keep the state of last time as it is turned off. If you select **Off**, this function is disabled. **Default is On.**

Key Sound

This instruction can switch on/off the buzzing sound when you press any key, if you select **On**, the buzzer will sound when any key was pressed. If you select **Off**, the buzzer will not sound when the keys were pressed. **Default is On**.

ShortCut Recall

This function can help you recall the data stored before.
Option:

1）Press Shift + MENU into menu operation, VFD displays **Config**, press ENTER to confirm.
2）Press▲、▼to select **ShortCut Recall**, press ENTER to confirm.
3）Press▲、▼to select **On**, press ENTER to confirm.
4）Press ESC two times to escape menu operation.
5）Press V-set or I-set , select 0 to 9 to set voltage value or current value, press ENTER to confirm.
6）Press Save, VFD displays **Store 1**, select 0 to 9 to set the register number（range from 1 to 50）, press ENTER to confirm.

You can recall the data stored before by pressing the register number.

Over voltage Protection（>OVP Set）

When the output voltage exceeds the constant voltage by 5%, or the connection is unsuccessful under remote sense mode, the power supply will protect itself automatically. The power supply must be turned on again. When the power is in overvoltage protection, the output is off, and buzzer is mooing. VFD displays as following:

Over Voltage

When the power supply with other power supply is in parallel connection, please disable this function.

Setting Communication Baud Rate (>BAUDRATE)

This function can help you set communication baud rate. There are 4 kinds of baud rate, 4800HZ, 9600HZ, 19200HZ and 38400HZ. Make sure that power's baud rate is as the same as your computer before communication. **Default baud rate is 4800HZ.**

Setting Address(>ADDRESS)

This instruction can set the communication address for each power supply. The address range is from 0 to 30. Before the communication, you must make sure that there is same address between the power supply and the computer. **Default address is 0.**
Option:

1） Press Shift + MENU into menu operation, VFD displays **Config**, press ENTER to confirm.
2） Press▲、▼to select **Address Set**, press ENTER to confirm.
3） VFD displays **Address= ＊ ＊**, select 0 to 9 and set address, press ENTER to confirm.

4） Press ESC two times to escape menu operation.

Port Mode

The level of the port on the rear panel is TTL, and the port has 3 kinds of function as follows:

TRIGGER: pin1 and pin 2 can be used as the external trigger source for power supply, and can control the list operation.

RI/DFI: Inhibit Input can control the output state of power supply, Fault Output can find fault of power supply.

DIGITAL I/O: It can read and control output and input state.

Pinmode	Trigger	RI/DFI	DIGITAL I/O
1	Trigger in	Inhibit Input	Digital Input
2	GND	GND	GND
3	No Use	Fault Output	Digital Output
4	No Use	GND	GND

Trigger Operation (Shift+Trigger)

The power supply has 3 kinds of trigger mode. You must choose trigger source before trigger operating.

Trigger Key: If this function is enabled, press Shift + Trigger, the power supply will start trigger operation once.

External trigger signal(TTL): There is a trigger input port on the rear panel. When this function is enabled, please give this trigger input port a pulse about 5 mS, and the power supply will start trigger operation once.

Bus: When this function is enabled, and the power supply receives order ***TRG or TRIgger**, the power supply will start trigger operation once.

Remote Inhibit

RI input has 3 modes: **LATCHING**、**L IVE**、**OFF**

LATCHING: When the level of **RI** port changes from high to low, the output of power supply is off.

LIVE: The output state of power supply changes along with the level of **RI** port. If the level of **RI** is high, the output is on; and the level of **RI** is low, the output of power supply is off.

OFF: The level state of **RI** do not affect the output state of power supply.

Discrete Fault Indicator

DFI source contains **QUES**、**OPER** 、**ESB**、**RQS**、**OFF**.

QUES: The output level of **DFI** changes along with the state of **QUES** bit. When **QUES** bit is 1, **DFI** outputs low level. When **QUES** bit is 0, **DFI** outputs high level.

OPER: The output level of **DFI** changes along with the state of **OPER** bit.

ESB: The output level of **DFI** changes along with the state of **ESB** bit.

RQS: The output level of **DFI** changes along with the state of **RQS** bit.

OFF: The output level of **DFI** remains high.

KEY LOCK

This instruction can set a password (1 through 4 digits) to lock the function keys operation. After setting the password, all the function keys on the front panel will be locked except the **OUT on/off** key. You must enter the correct password to unlock them, then you can continue to do the function key operation. If you don't want to lock the function keys, please don't press any number key when you enter the >KEY LOCK instruction, just press **ENTER** key to unlock it.

Note: When shipped from factory, there is no password and function keys are unlocked. The start bit of your desired password shouldn't be 0.

List Set

Before you edit the list file, please set trigger source as "immediate" in the menu.
Action:

1) Press Shift + Menu into the menu.
2) Press up or down key to select **"Config"**, press Enter to confirm.
3) Press up or down key to select **"Trig Source"**, press Enter to confirm.
4) Press up or down key to select **"Immediat"**, press Enter to confirm.

You can make the input change order by editing every step value of list operation. The parameter of list operation includes the name of list file, input step (no more than 400 steps), step time (the minimum is 1mS) and every step value. The list file can be stored in ROM whose capacity is 4K, and it can be fast recalled. This store area is divided into A, B, C and D four areas. In area A, there is only 1 group whose capacity is 4Kb. In area B, there are 2 groups and each group's capacity is 2Kb. In area C, there 4 groups and each group's capacity is 1Kb. In area D, there are 8 groups and each group's capacity is 512b.
If the list operation mode is CONTINIOUS, when you receiving a trigger signal, the power supply will start list operation until the list operation is over or a trigger is received again.

Operation:

1） Press Shift + Menu into menu operation.
2） VFD displays **Config**，press▼to select **List Set**，press Enter to confirm.
3） VFD displays **Call ListFile**，press▼to select **Edit ListFile**, press Enter to confirm.
4） VFD displays **Continuous**，press Enter to confirm.
5） VFD displays **Once**, press▼to select **Repeat**，press Enter to confirm，select circle operation.
6） VFD displays **Second**, press▼to select **MilliSecond**, press Enter to confirm, select time unit.
7） VFD displays **List Count=** _, press numeric key or move the rotary knob, set circle times(in this example, count is 2)，press Enter to confirm.
8） VFD displays **1th= * . * * * * V**, press numeric key or move the rotary knob, set the maximum voltage, press Enter to confirm.
9） VFD displays **1th= * . * * * * A**, press numeric key or move the rotary knob, set the maximum current, press Enter to confirm.
10） VFD displays **1th= * mS**, press numeric key or move the rotary knob, set delay time, press Enter to confirm.

11） VFD displays **2th=＊.＊＊＊＊V**, press numeric key or move the rotary knob, set the maximum voltage, press Enter to confirm.

12） VFD displays **2th=＊.＊＊＊＊A**, press numeric key or move the rotary knob, set the maximum current, press Enter to confirm.

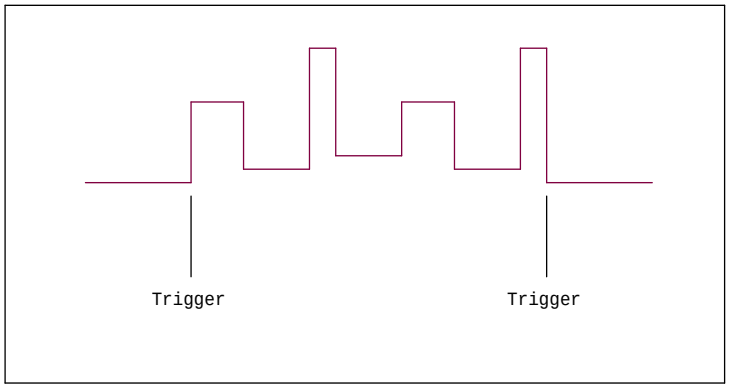
13） VFD displays **2th=＊mS**， press numeric key or move the rotary knob, set delay time, press Enter to confirm.

14） VFD display **Store File**_, press numeric key or move the rotary knob, set the register number（1 to 8）, press Enter to confirm.

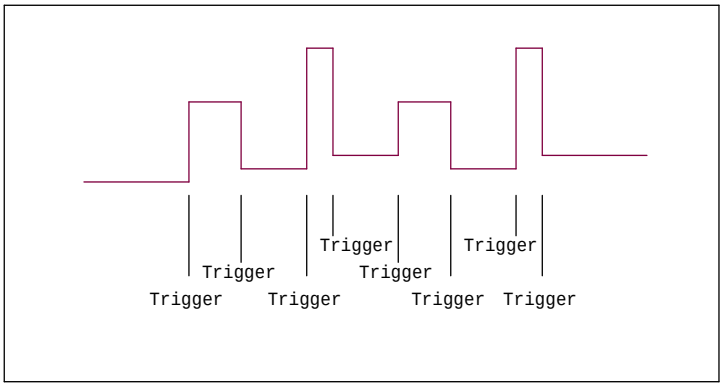
15） Press Esc two times to escape menu operation.

16） Press Shift + List to set the list file, then press Shift + Trigger to run the list file. Press Shift + List to stop.

If you have edited several list files, you can call the list file that you need by “Call ListFile” function in the menu. Press Esc two times to exit menu operation. And then press Shift + List to set it, press Shift + Trigger to run the file that you call. press Shift + List to stop running.



When the list operation mode is **STEP**, the power supply will go to the next step when receive a trigger signal.



Digital I/O

When the digital port of the power supply mode is DIGITALI/O and power supply is under remote sense, you could send SCPI order （DIGital:INPut[:STATe?] and DIGital:OUTPut[:STATe?]）to read and set the state of output and input port.

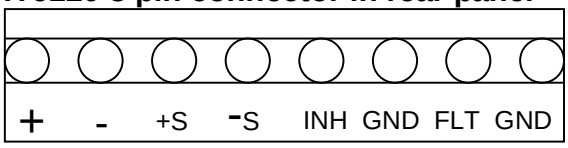
3.7 Output Operation

If you control the power supply by front panel, you can press On/Off and switch the state of output. If power supply is under remote sense, you can send SCPI order (OUTPut ON|OFF) to change the state of output.

3.8 Remote Sense

The wire connected the power supply and electronic load will produce voltage difference when the current of the power supply is so big. In order to make the measurement accuracy much accurate, there are 4 pin trigger and remote sensing connectors on the rear panel and you can use it to measure the output voltage of the tested instrument. You must set remote sense mode before you start remote test function.

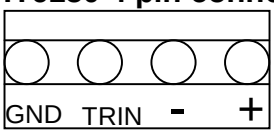
IT6120 8 pin connector in rear panel



+,-: Output port, they are as the same as the output in front panel
+S,-S: Sense port
INH: this port hat multiple function
When “Port Mode” in the menu is set with “Trigger”, **INH** is trigger port.
When “Port Mode” in the menu is set with “RI/DIF”, **INH** can set the output status on/off. Here **INH** port has 3 working mode to choose.
LATCHING: When the level of **INH** port changes from high to low, the output of power supply is off.
LIVE: The output state of power supply changes along with the level of **INH** port. If the level of **INH** is 1, the output is on; and the level of **INH** is 0, the output of power supply is off.
OFF: The level state of **INH** do not affect the output state of power supply.
When “Port Mode” in the menu is set with “DIGITAL I/O”, **INH** port becomes the digital input port to read input status by communication order.

FLT: this port hat multiple function
When “Port Mode” in the menu is set with “Trigger”, FLT is an invalid port.
When “Port Mode” in the menu is set with “RI/DIF”, FLT port can find fault of power supply.
FLT source contains **QUES, OPER, ESB, RQS, OFF**.
QUES: The output level of **FLT** changes along with the state of **QUES** bit. When **QUES** bit is 1, **FLT** outputs low level. When **QUES** bit is 0, **FLT** outputs high level.
OPER: The output level of **FLT** changes along with the state of **OPER** bit.
ESB: The output level of **FLT** changes along with the state of **ESB** bit.
RQS: The output level of **FLT** changes along with the state of **RQS** bit.
OFF: The output level of **FLT** remains high.
When “Port Mode” in menu is set with “DIGITAL I/O”, **FLT** port becomes output port to control the output status by communication order.

IT6150 4 pin connector in rear panel

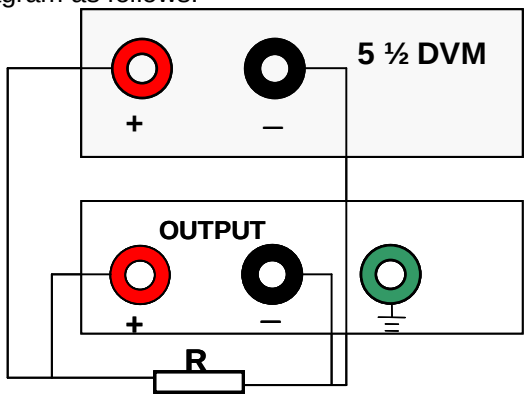


GND,TRIN: Trigger port

-,+: Remote sense port

3.9 Milliohm Meter

SOURCE METER can measure resistant value accurately and the biggest resistance it can measure is 1kΩ. In order to protect the resistor, please select the power range of the resistor before you measure it. Wiring diagram as follows:



There are 3 ranges to be chosen: 0.1W、1W、10W.

The accuracy of the measurement is <1%, the higher range you select, the more accurate result you can get.

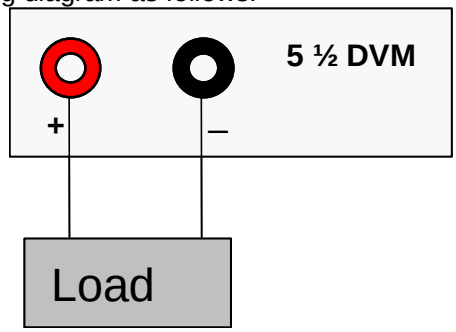
Option:

1）Press Shift +V/mΩ（if VFD displays **＊＊.＊＊V**, press Shift +V/mΩ）, set m**:＊＊**, you can measure resistance value.

2）Press Shift +**0.1W /1W /10W**, you can set different range of milliohm meter.

3.10 Voltage Meter

Wiring diagram as follows:



Press Shift +V/mΩ（if VFD displays **Range:** ＊＊, please press Shift +V/mΩ）, VFD displays **＊＊.＊＊V**, you can begin to test the voltage value.

The accuracy is <0.1%.

Chapter 4 Remote Operation Mode

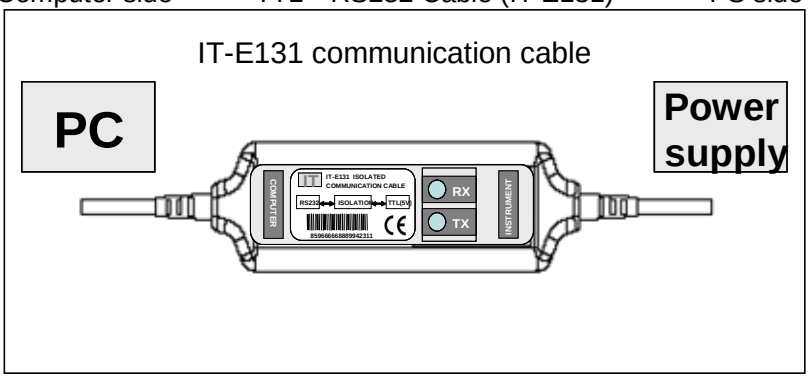
The DB9 interface connector on the rear panel of the power supply can be transferred to RS-232 interface, the following information will tell you how to use the computer to control the output of the power supply.

4.1 Communication cable

IT-E131 RS232 Communication Cable

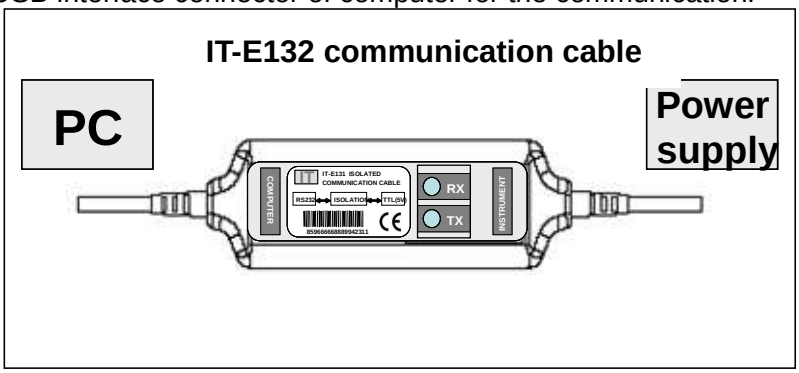
The DB9 interface connector on the rear panel of power supply is TTL voltage level; you can use the communication cable (IT-E131) to connect the DB9 interface connector of the power supply and the RS-232 interface connector of computer for the communication.

Computer side TTL→RS232 Cable (IT-E131) PS side



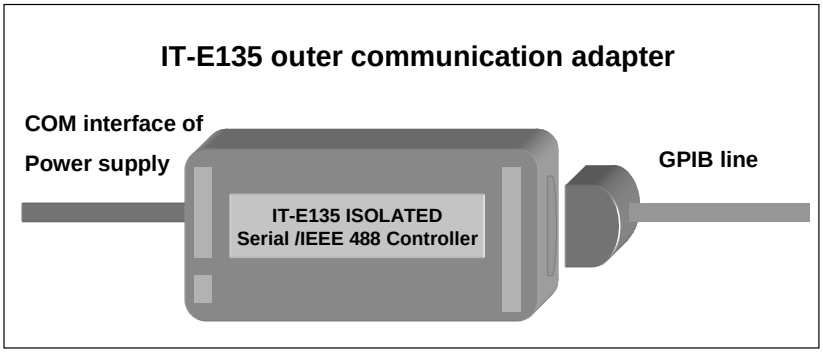
IT-E132 USB Communication Cable

The DB9 interface connector on the rear panel of power supply is TTL voltage level; you can use the communication cable (IT-E132) to connect the DB9 interface connector of the power supply and the USB interface connector of computer for the communication.



IT-E135 GPIB Communication Cable

The DB9 interface connector on the rear panel of power supply is TTL voltage level; you can use the GPIB communication cable (IT-E135) to connect the DB9 interface connector of the power supply, and then connect the GPIB interface of the IT-E135 and computer with GPIB/IEEE 488 line for the communication.



Note: Forbidden to connect DB9 connector in power supply directly with PC or other RS232 port.

4.2 Communication between Power Supply and Computer

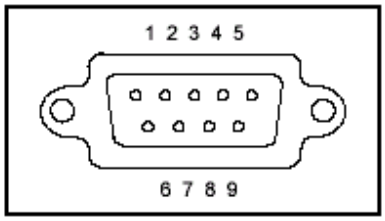
Before using the remote operation mode, please make sure that the baud rate and communication address in power supply are the same as in the computer software, otherwise, the communication will fail, you can change the baud rate and communication address from the front panel or from computer.

1. Address: the range is from 0 to 254，default setting is 0
2. Baud rate: 4800,9600,19200 and 38400 are selectable, default setting is 4800
3. Data bit：8 bit
4. Stop bit：1
5. Parity：None

Parity=None	Start Bit	8 Data Bits	Stop Bit	Stop Bit

1. End of String is '\n'(0x0a)

2. DB9 Interface Details



DB9 in the rear panel of power supply is TTL level signal. It can be connecting with standard PC interface through the isolated communication cable.